Key Features of Management of Technology (MoT) Undergraduate Program in Malaysia

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Abstract

Management of Technology (MoT) Education is growing both in numbers and importance. There are more than 200 universities in the world that are offering MoT programs. However, these universities have taken different approaches with respect to the names and designs of the programs. In Malaysia, some of the programs are known as Technology Management, Production & Operation and Industrial Management. The curriculum structures and contents of the programs also vary. For more effective MoT education in Malaysia, it is necessary to consider both the national agenda and business requirements for more practical MoT education approach. This study described two MoT undergraduate programs in one public institution in Malaysia to fill in the literature gap on MoT education in Malaysia. It adapted the IAMOT MoT Credo as a framework for comparing the structure and contents of the programs. The findings concluded that, although the two programs have met the IAMOT Credo's requirements, they have distinctive features. These distinguishing characteristics reflected the Malaysian's human resource needs.

Keywords: Management of Technology (MoT) education, MoT credo, Malaysia

1. Background

Global competition, rapid technological change and diversification have been the major drivers for establishing Management of Technology (MoT) as a discipline in 1987 (The United States National Research Council, 1987). The needs continue after over 25 years when managers with technological competencies have been recognized as a greater player in the knowledge-based economies (Barr et.al. 2009). Organizations are trying to find ways in which to optimizing utilization of technology to gain competitive advantage (Bellamy et.al.,2001). Having state-of-art technologies are no longer the pre-requisite of an organization to compete globally. Instead, recognition of technologies as strategic inputs, mastering key technologies and be able to link technological aspects into other key performance indicators of an organization are three major requirements in managing technology strategically (Khalil, 2000). Nevertheless, appropriate training and education to achieve the goals are strongly needed. However, there is still lack of MoT programs within universities that equipped the graduates with relevant competences in managing technology effectively and efficiently to achieve competitiveness. Thus, this paper has two primary objectives. The first objective is to provide a description of two MoT programs using the MoT CREDO as a guideline. The second objective is to discuss of the features of MoT programs in Malaysia as one of the developing country. The discussions will lead to a better understanding of the features of MoT programs and their relevancy in the country.

2. Background

There is a growth in the number of formal MoT programs in the world. It has been actively developed in the United States and the Europe as early as in the eighties (Hang et.al.,2009). However, there is still no indication that the growth in number of these programs is reaching a maturity point. The titles and the contents of the programs continue to vary. As a result, conferences, collaborations and also forums all over the world have been actively discussed on the features of MoT programs in the world. There was an attempt by the International Association for

Management of Technology (IAMOT) as one of the prominent associations in MoT to develop a guideline to accredited MoT programs at post graduate levels. The guideline was developed through a survey among MoT stakeholders all over the world. The survey concluded that there are five knowledge groups of MoT education, which are:

- Management of Technology (MoT) Centered Knowledge
- Knowledge of Corporate Functions
- Technology-Centered Knowledge
- Special Requirements/Assignments
- Knowledge of Supporting Disciplines

(Yanez et.al., 2010)

Earlier, in 2003, IAMOT has embarked an effort to define the field of MoT as an academic program (Wyk, 2003). As a result, a credo for MoT program has been established. Nevertheless, it is only meant for post graduate levels and the undergraduate programs continue to have fewer attentions from the associations. Perhaps, in developed countries where technologies are produced MoT is more relevant at post graduate levels. Yet, in the developing countries, MoT programs are relevant at both levels; at the undergraduate levels and also at the post graduate levels.

Similarly, there are five public universities which offer MoT programs at undergraduate and post graduate programs in Malaysia since 1991. However, the programs' titles vary. The understanding of what and how MoT programs should be conducted also differ. These programs are called Bachelor Degree in Management (*Technology*), Bachelor Degree in Technology Management, and Bachelor Degree in Technology Management (Production and Operation), Bachelor Degree in Industrial Technology Management, Bachelor Degree in Technology Management (*Innovation Technology*) and Bachelor Degree in Technology Management (*High Technology Marketing*).

3. Research Methodology

This study employed qualitative multiple-case study approach. Multiple case studies should be regarded as *multiple experiments* rather than *multiple respondents* and so *replication logic* and not *sampling logic* should be adopted to choose the cases (Yin, 2003). Two MoT programs at undergraduate levels in Universiti Tun Hussein Onn Malaysia were compared. There is no precise guide to the number of cases as Patton (1990) claims; *there is no rule of number of cases in qualitative research* (Patton: 181; 1990). Interviewees were selected using purposive sampling due to the nature of the study which requires descriptions of an episode and explanations of events (Stake, 1995). Interviewees included faculty members, program directors from both programs. Case study protocol was developed to enhance the consistency of the case study research (Yin, 2003). The case study protocol comprises of the CREDO components as in Box 1.0.

Insert Box 1.0

We used the structure and content mainly from Miles and Huberman (1994) in explaining the analysis; as it is comprehensive despite its simplicity to understand and widely cited by most authors in qualitative research. Furthermore, the descriptive analysis would enhance the understanding on objectives covered in this study.

4. Results and Discussions

4.1 The titles of the programs

The titles of the two programs reflected MoT's name as suggested in the IAMOT Credo. The programs' titles are known as *Bachelor of Technology Management (BTM)* and *Bachelor of Technology Management (Production and Operation) (BTMPO)*. This practice is similar with the practices in other South East Asia Region such as the Philippines (Pike, 2009), and Singapore (Hang et.al.,2009). This indicates that MoT can be described in diverse names, depends on the focus of the offering schools.

4.2 The structure and components of the programs

Both programs comprised of business and management components, technology management and university's subject components which is consistent with the IAMOT Credo. However, percentage of subjects in each component varies. There are two important contributing factors affecting this structure:

(i) *Rules and Procedures* set by the Malaysian Qualification Agency (MQA) (accreditation body), whereby each of a Bachelor degree program must at least comprise of 120 credit hours with at least 15% must represent the University's subjects.

(ii) *The objectives of the programs* where they must fulfill the designated purpose set forth earlier by the respective University and hosted Faculty.

Table 1.0 summarizes the comparisons for each of the components for the two programs.

Insert Table 1.0

There are ten courses representing the University's components. Among the courses are Religious Studies, Nationhood and Extra Curriculum. One of the purposes of introducing the University's courses is to develop the patriotism spirit among the students. Meanwhile, the main purpose of having the courses in business and management is to prepare the students with the knowledge of business functions such as marketing, finance, accounting, operations, management information systems and human resource management. Amongst the technology component courses are technology management, technology transfer, product development and production forecasting. These courses distinguish courses of MoT graduates and general management graduates.

These programs are aimed to produce graduates who would later become competent MOT personnel who are multidisciplinary in nature. These graduates are expected to be fully equipped in terms of the knowledge in general management and technology management, possess analytical and technical skills and soft skills necessary to perform effectively in various organizations.

4.3 Technology Concepts in the Courses

Both programs have integrated technology concepts in some of the courses such as technology management and technology and culture. The main purpose of the approach is to enhance the understanding of the students in dealing with technologies in creating business growth and competitiveness. In addition, it has been recognized that, the competency of fully utilizing technology and channel it for the economic and strategic well being of an organization is the essential success for an organization.

4.4 Future prospect of MoT graduates

Evidently, technology management programs in this university do not aim at producing engineers but more to connect the missing link between engineering and scientific knowledge and general management as indicated in Figure 1.0.

Insert Figure 1.0

This unique feature distinguishes the MoT graduates with the general management graduates. The MoT graduates are equipped with competencies to manage technology effectively and efficiently in any organizations and not only focusing on the *high technology* organizations. Furthermore, Malaysia's preparation in becoming a developed country by the year 2020 is also a contributing factor to the direction of empowering the technology management programs in Malaysia. The aspiration is not only shared in Malaysia but also other countries all over the world. Consequently, in the previous 12th IAMOT conference in 2002, world academicians and researchers of technology management have also agreed to direct technology management as a fundamental part in empowering innovation and sustainable development all over the world.

5. Conclusions

There will be a continue debates on what or how MoT as a field should be defined among academics and practitioners in Malaysia. However, the IAMOT Credo has served as a frame in defining MoT programs in this University. This study has also identified other features in defining MoT programs in Malaysia which are reflected by the needs of the nation. The key features which distinguish MoT programs are; (i) it is hosted by the Faculty of Technology Management, Business and Entrepreneurship and not Faculty of Engineering as most universities in the developed country, (ii) the programs are offered mostly at undergraduate levels compared to those developed countries which offer MoT programs mostly at post-graduate levels, (iii) it is a multidisciplinary program encompassing both technology and management fields and (iv) the human capital produced are equipped with relevant competencies to fulfill the industrial needs such as technology development competencies, business competencies, personal skills, and management/administration competencies.

Malaysia as a developing country has shifted its paradigm from labor intensive to knowledge based economy. Thus, it needs human capital that can value technology and have the ability to align resources (*technologies*) with management of technological uncertainty and creativity. Malaysia is still a *'technology user'* and yet to be a technology provider. As a result, human capital that is competent in reaping the most of the technologies to create wealth for the nation are much needed. At present, a comprehensive study is being carried out on all the technology management programs based in Malaysia to depict the MoT programs in Malaysia. The findings contribute to the

development of a Credo for MoT undergraduate programs especially in Malaysia. Consequently, it will be another contribution to MoT education especially from the Asia Region's perspectives.

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Box 1.0: Elements Developed for the Protocol Used within the two programs

- **Name of the program**

Technology is a large and growing part of every manager's daily experience. Managers develop technology, use technology, buy technology and sell technology. To provide the necessary skill base in this area, it is appropriate that educators develop a field of teaching and research that we may call management of technology (MOT). The term management is broadly used to include the work of corporations, not-for-profit institutions and public bodies.

- **Structure and Components of the programs**

Academic programs should offer three components: (i) The first component is the accepted range of management specialties such as the corporate functions of marketing, operations, MIS, and finance, as well as overall strategy. (ii) The second component is knowledge of technology itself and of technology related management procedures. Topics would include: A core theory of technology, technology foresight and forecasting, emerging technologies, innovation management, project management, science and technology policy, and many more. The second component distinguishes MOT programs from general management programs. (iii) The third component covers the contextual setting of MOT. It stresses the more holistic view and addresses topics of ethics, environment, evolution, macro-economics and politics. In the further evolution of the field, Program Directors will work towards an integration of the various components and possibly towards a new theory of innovation driven enterprise.

- **Technology Concepts in the courses**

A core theory could include such basic concepts as: (i) A definition of technology and a description of its manifestations. (ii) The anatomy of technology - diagnosing unique features of a given technology. (iii) The taxonomy of technology - systems of classification. (iv) The evolution of technology - major trends in technology and how to track them. (v) The ecology of technology - the interaction of technology with other systems. MOT programs should address technology at an operational, at a strategic and at a policy level. The operational level focuses on the internal technology base of the organization. The strategic level includes mapping the future, external, technological landscape; identifying technology based opportunities, and aligning overall strategy to harvest these opportunities. Foresight is a key ingredient. The policy level addresses the interaction between MOT and national and international policy.

- **Future prospect of MoT graduates**

To contribute to MOT as a profession, we need to work towards (i) a community of practitioners, (ii) a body of knowledge, and (iii) the clearer positioning of the field in the mind of the public. (The body of knowledge would reflect the academic program as mentioned in 2.)

Source: Modified from Van Wyk, (2003)

Table 1. Percentage in each component of BTM and BTM (PO) programs

Programs	Components (%)		
	Management and Business	***Technology***	***University's courses***
BTM	40	45	15
BTM (PO)	39	46	15

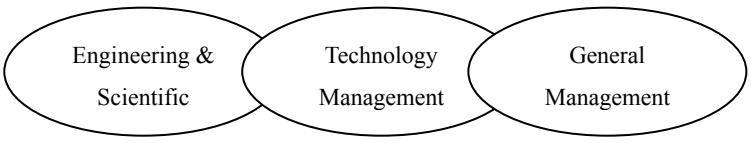

Figure 1.Technology Management: The Missing Link

Source: Tschiky (2004)